The UAE Telematics System
A Flexible End-to-End Solution
Outline

1. Introduction
   • Background information
2. Use cases
3. System architecture
   • End-to-end solution
   • Gateway
4. Business aspects
5. Client software
   • Life cycle management
   • Security management
   • Resource management
The UAE Telematics System pilot project was a joint development between
• the United Arab Emirates University and
• IBM
UAE: a wonderful place for living with world-class infrastructure...
But …… statistics on UAE (Dubai) traffic, accidents and casualties

Source:
- UAE Ministry for Interior & Dubai Municipality
- http://www.drivesafelyarabia.org/traffic-statistics.htm
## Use cases – focus on safety / security

### Use cases:

**Pilot road safety / security aspects:**
- Speeding violation
- Emergency function

**Additional convenience use cases**
- Parking guide
  - Reservation, billing, assistance
- Anti-theft concepts
  - Driver authorisation / identification features
  - Car tracking, car location
- Mobile office
  - „Virtual passenger“, via text-to-speech, voice recognition.
- In-car entertainment
  - Video-on-demand, internet access, MP3, ...

### Add. telematics services

- **Dynamic traffic control**
  - Embedded actual traffic information
  - Embedded actual vehicle data (speed, delay times, webcam)
  - Floating car data services

- **Road user charge**

- **Roadside assistance**
  - Realtime road conditions and weather reports

- **Emergency functions**
  - Emergency call in case of accident
  - Detailed failure report to next garage in case of breakdown

- **Remote maintenance and diagnostics**
  - Maintenance when its necessary
  - Driver- / garage information prior to breakdown
  - Preventive breakdown management

- **New insurance models**
  - Pay as you drive™

- **„Young driver“ assistance**
  - Improve driving behaviour
  - Reduce risky drive exercises
  - Decrease speed violation

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**Implementation of additional services possible**
Vehicle data and information are exchanged via existing GSM network to telematics gateway.

Telematics Gateway
- Receives & stores vehicle / event data
- Runs customized calculations
- Sends data to workplace
- Device management – IBM WEDM

Telematics System
- Get GPS position information
- Do real-time map matching and store the data
- Compares driven speed with speed limit by street
  - Informs driver
  - Sends data and information to Telematics Gateway

IBM
Thomas Walz
Hagen Schwarz
Pilot speeding use case software

- Map Matching Bundle
  - Map matching software using GPS position and route history to retrieve information from the digital map such as:
    - State, city, street
    - Current speed limit
  - No routing / navigation information is available!
  - Based on standardized digital maps
Advantages of the UAE Telematics system – Safety and emergency solution

**Safety**
- Supports the driver to increase his safety by continuously monitoring on-board dangerous behaviour
  - Inform / warn the driver
  - Send information to telematics gateway in case of continuous dangerous driving
- All information and sensors are available so the telematics device can operate self-sustaining.
  - GPS sensor
  - Digital map of the UAE
  - Traffic sign information
  - GSM / GPRS communication

**Emergency Service**
- One button emergency call
- Voice call to emergency operator
- If driver is not able to communicate, all important information is send to the gateway to support the emergency operator to initiate the appropriate actions:
  - Date & time
  - Licence plate, driver name
  - Last map matched position, current GPS position
  - Position will be visualized onto a graphical interactive map
IBM WebSphere Portal Server based
- Using WebServices
- Utilizing third party map visualization via WebServices interface
Gateway Portal Server Application – Event Query

The following events were found for the given criteria:

<table>
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<tr>
<th>Action</th>
<th>Date</th>
<th>Time</th>
<th>License plate</th>
<th>Driver</th>
<th>City</th>
<th>Street</th>
<th>Speed limit</th>
<th>Driven speed</th>
<th>Difference</th>
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<td>20:27:11</td>
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<td>-</td>
<td>Ain</td>
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Gateway Portal Server Application – Speeding Details

Speeding Details and Location

License plate: Dubai 3 15130
Date: 25.08.2004
Time: 20:02:07
Driver: busch
Street name: Hamdan Ibn Mohammad St
City: Al Ain
Region: Abu Dhabi
Country: United Arab Emirates
SmartBoxID: 21
Speed limit: 60 km/h
GPS speed: 77 km/h
GPS Heading: 271°
GPS latitude: 24.242668°
GPS longitude: 55.715137°
GPS probability: 0.0
Type of violation: Continuous

Configuration data
Duration of speeding 1: 1 seconds
Duration of speeding 2: 10 seconds
Duration of speeding 3: 15 seconds
Duration of speeding 4: 30 seconds
Speed offset: 0 km/h
Absolute speed tolerance: 0 km/h
Relative speed tolerance: 0.0 %
Software version: 1.0
Telematics client installed in pilot cars

Smart Car

Mercedes C-Class Car

Thomas Walz
Hagen Schwarz
Business Aspects – Why did we choose OSGi / SMF

• Protect customer investments by:
  – Support open standards
  – Cross platform
    • Support multiple hardware platforms when Java / OSGi enabled
      – Operating system independant, e.g. QNX, Linux, Windows
  – Cross industry
  – Supported by industry leaders
  – Services oriented
    • Bundle architecture, third party software enabled

• Outlook
  – Additional use cases / telematics services
  – Project for volume roll-out in UAE signed and started
UAE Telematics Client Software Stack

- Road Safety Application
  - Map Manager
  - Communication Manager
  - Phone Wrapper
- Navigation Application
  - Device Manager
  - GPS Wrapper
- Diagnostics Application
  - Permission Manager
  - Audio Wrapper
- Other Applications...
  - Other Managers...
  - Other Wrappers...

- OSGi Framework (IBM Service Management Framework)
- Java Virtual Machine (IBM J9)
- Real Time Operating System (QNX)
- Telematics Embedded Hardware
Life Cycle Management – Client View

• Requirements
  – Initial provisioning
  – Software distribution
  – Device configuration
  – Over The Air (OTA)

• IBM WebSphere Device Manager as OSGi bundle
  – Install, uninstall, and update bundles
  – During runtime

• Types of updates
  – Device configuration
  – Software updates
  – Map data
  – 3rd party bundles
Client Security

- Security mechanisms
  - PermissionAdmin service
  - Policy files

- Types of permissions, e.g.
  - AdminPermission
  - ServicePermission

- Permission Manager
  - Sets permissions based on a bundle’s policy

- OSGi R4: Conditional Permission Admin
  - Extended and thorough security model
  - Signed bundles (OSGi R4)
Client Resources – Evaluation

- Restrictions required
  - For 3rd party bundles
  - Against erroneous and malicious software

- Possible types of resource restrictions:
  - Memory (Flash, RAM)
  - Threads
  - Sockets
  - Startup time

- Possibilities of implementations:
  - Resource management within/on top of Java
  - Two (or more) VMs
    - To separate system critical from 3rd party or other less controlled bundles
    - Resource restrictions on operating system level
Q & A

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